

Revision of the genus *Ophryophryne* Boulenger, 1903 (Megophryidae) with description of two new species

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Study of type specimens and newly collected specimens of frogs of the oriental genus *Ophryophryne* Boulenger, 1903 lead to the redefinition of the recognized taxa and the recognition of two new species, one reported from Vietnam and Laos, and the second only from Vietnam. *Ophryophryne poilani* Bourret, 1937 is put to the synonymy of *Ophryophryne microstoma* Boulenger, 1903. The range of the species *O. microstoma*, which includes Vietnam and China, is extended to Thailand. *Ophryophryne pachyproctus* Kou, 1985 is confirmed by a new specimen from Vietnam.

Ophryophryne Boulenger, 1903 is a member of the family Megophryidae Bonaparte, 1850 as defined by FORD & CANNATELLA (1993). Sister-group of *Xenophrys* Günther, 1864 as defined by DUBOIS & OHLER (1998), it is either regarded as a separate genus (recent references: YE et al., 1993, MANTHEY & GROSSMANN, 1997) or as a subgenus of *Megophrys* Kahl & Van Hasselt, 1822 (DUBOIS, 1980).

The genus *Ophryophryne* was described in 1903 by BOULENGER (1903a) who mentioned both its close morphological resemblance to *Megophrys*, and its lack of maxillary and vomerine teeth and the presence of a horizontal pupilla, characters defining the family Bufonidae Gray, 1825. Although BOULENGER (1903a) was aware of the problem of using isolated characters in making taxonomic decisions, he included his new genus into the Bufonidae (BOULENGER, 1903b). Despite the work of NOBLE (1926), who clearly recognized this genus as a member of the Pelobatidae (including then the subfamily Megophryinae), close to the genus *Megophrys*, most authors continued to consider it to be a member of the Bufonidae (see review in DUBOIS, 1980: 470, recent reference, NGUYEN & HO, 1996). The description of the tadpole (LIU & HU, 1962) and the study of external morphology indicated *Ophryophryne* to be a megophryid and closely related to *Megophrys* (DUBOIS, 1980). Recent studies based on cytology and adult and larval morphology confirmed *Ophryophryne* to be the sister-group of *Xenophrys*, a group formerly included in the genus *Megophrys* (TIAN & HU, 1985: 220; RAO & YANG, 1997; DUBOIS & OHLER, 1998).

The genus was described to include one species, *Ophryophryne microstoma* Boulenger, 1903. In 1937, BOURRET described a second species, *Ophryophryne poilani*, based upon a single, badly preserved specimen. Not until 1985 was a third species described by KOU, *Ophryophryne pachyproctus* from southern China (Yunnan).

In recent years important new material of amphibians was collected in South-East Asia. INGER et al. (1999) reported on the three species of *Ophryophryne* from southern Vietnam. Beside the material collected in Vietnam, I had the opportunity to study the type-specimens of the three nominal species and other material stored in museum collections. The analysis of these data led me to describe two new species in this genus and to put *Ophryophryne poilani* in the synonymy of *Ophryophryne microstoma*.

MATERIALS AND METHODS

The material studied is listed under the appropriate species and is deposited in the museums mentioned below. My study is based on morphology and morphometry of formalin-fixed and alcohol-preserved specimens. Data on live animals are added when available. The descriptions, methodology and terminology follow OHLER (1996) and DUBOIS & OHLER (1998). The webbing formula used is that of MYLRS & DUELLMAN (1982). All measurements are in millimetres. The tables present measurements and their per mille ratios to SVL (in brackets) with the associated mean and standard deviation. Abbreviations for measurements and institutions are as follows:

SVL, snout-vent length.

Head. HW, head width; HL, head length (from posterior edge of mandible to tip of snout); MN, distance from posterior edge of mandible to posterior border of nostril; MFE, distance from posterior edge of mandible to anterior corner of eye; MBE, distance from posterior edge of mandible to back of eye; IFE, distance between anterior corner of eyes; IBE, distance between posterior border of eyes; IN, internarial space; EN, distance from anterior corner of eye to posterior border of nostril; EL, eye length; SN, distance from anterior border of nostril to tip of snout; SL, distance from front of eye to tip of snout; TYD, greatest tympanum diameter; TYE, smallest distance from anterior border of tympanum to posterior corner of eye; IUE, minimum distance between upper eyelids; UEW, maximum width of inter upper eyelid.

Forearm. HAL, hand length (from base of outer palmar tubercle to tip of toe); FLL, forelimb length (from elbow to base of outer tubercle); TFL, third finger length (from base of first subarticular tubercle).

Hindlimb. FL, femur length (from vent to knee); TL, tibia length; FOL, foot length (from base of inner metatarsal tubercle to tip of toe); FTL, fourth toe length (from base of first subarticular tubercle); TFOL, distance from base of tarsus to tip of fourth toe.

Webbing. MTTF, distance from distal edge of metatarsal tubercle to maximum incurvation of web between third and fourth toe; T1-TF, distance from maximum incurvation of web between third and fourth toe to tip of fourth toe; MTFF, distance from distal edge of

metatarsal tubercle to maximum incurvation of web between fourth and fifth toe; FFTF, distance from maximum incurvation of web between fourth and fifth toe to tip of fourth toe.

mm, not measured

p.m., per mille.

BMNH, Natural History Museum, London, United Kingdom.

CIB, Chengdu Institute of Biology, Chengdu, Sichuan, China.

FMNH, Field Museum of Natural History, Chicago, Illinois, USA.

IEBR, Institute of Ecology and Biological Research, Hanoi, Vietnam.

MNH, Muséum national d'Histoire naturelle, Paris, France.

YU, Yunnan University, Kunming, Yunnan, China.

TAXONOMIC ACCOUNTS

Ophryophryne Boulenger, 1903

Ophryophryne Boulenger, 1903 186 Type-species: *Ophryophryne microstoma* Boulenger, 1903, by monotypy

Ophryophryne gerti sp. nov.

Holotype. – BMNH 1921.4.1.324, adult male, Cam Ly (river), south-east of Da Lat (11°56'N, 108°25'E), Lang Bian Plateau, sLam Dong Province, Vietnam.

Paratypes. BMNH 1921.4.1.323, young female, Dran (11°50'N, 108°34'E), Lang Bian Plateau, Lam Dong Province, Vietnam; BMNH 1972.15.2.4, adult male, Huey Sapan, Pak Maat (precise location not found), Mekong, Laos.

Other specimens examined. – VIETNAM: Buon Luoi, An He District, Gia-Lai Province: FMNH 252899, 252901.

Diagnosis. Small-sized *Ophryophryne*, with relatively long tibia, small tympanum, small head. Dorsal coloration uniform, dark. Supraorbital horn distinct, no dermal protuberance bearing anus.

Description of holotype (fig. 1). – (A) Size and general aspect (1) Specimen of rather small size (SVL 34.8 mm); body slender.

(B) Head (2) Head small, wider (HW 9.1 mm) than long (HL 8.5 mm, MN 7.5 mm; ME 6.5 mm, MBE 3.4 mm), convex. (3) Snout truncate, protruding, its length (SL 3.31 mm) shorter than horizontal diameter of eye (EL 3.95 mm). (4) Canthus rostralis rounded, loreal region slightly convex, acute in cross section. (5) Interorbital space concave, narrower (IUE 2.59 mm) than upper eyelid (UEW 2.98 mm) and than internarial distance (IN 3.05 mm); distance between front of eyes (IFE 5.31 mm) about two third of distance between back of eyes (IBE 7.9 mm). (6) Nostrils oval, with small flap of skin laterally, closer to eye (EN 1.23 mm) than to tip of snout (NS 1.62 mm). (7) Pupil rounded (in preservative). (8) Tympanum (TYD 2.14 mm) rounded, about half eye diameter and approximately equal to



Fig. 1. *Ophryophryne goni* sp. nov. BMNH 1921.4.1.324 holotype, adult male. SVL 34.8 mm. Dorsal view (top); lateral view of head (bottom).

tympanum-eye distance (TYE 2.07 mm) (9) Pineal ocellus absent. (10) Vomerine ridge absent. (11) Tongue rounded, with dorsal hollow, largely attached to mouth floor. (12) Supratympanic fold prominent, from eye to shoulder.

(C) Forelimbs. (13) Arm rather long, fore-arm (FLL 8.6 mm) longer than hand (HAL 8.0 mm), not enlarged. (14) Fingers I, II and IV short and thin; finger III long and thin (TFL 4.99 mm). (15) Relative length of fingers, shortest to longest: $I < II = IV < III$. (16) Tips of fingers rounded, not enlarged. (17) Fingers without dermal fringe; webbing absent. (18) Subarticular tubercles absent. (19) Prepollex oval, indistinct; palmar tubercles indistinct and supernumerary tubercles absent.

(D) Hindlimbs. (20) Shanks three times longer (TL 15.4 mm) than wide (TW 4.8 mm), about same length as thigh (FL 15.2 mm) and longer than distance from base of internal metatarsal tubercle to tip of toe IV (FOL 14.8 mm). (21) Toes long and thin, toe IV (FTL 7.0) about third of distance from base of tarsus to tip of toe IV (TFOL 21.4 mm) (22) Relative length of toes, shortest to longest: $I < II < V < III < IV$. (23) Tips of toes rounded, not enlarged (24) Webbing absent. $I\ 2 - 2\frac{1}{2}$ $II\ 2 - 3$ $III\ 2\frac{1}{2}$ $IV\ 4$ $2\frac{1}{2}$ V (MTTF 3.95 mm, MTFF 4.61 mm; FTTF 6.97 mm; FFTF 6.97 mm). (25) Dermal fringe along toe V absent (26) Subarticular tubercles absent. (27) Inner metatarsal tubercle flat, its length (IMT 2.07 mm) 1.16 times in length of toe I (ITL 2.40 mm). (28) Tarsal fold absent (29) Outer metatarsal tubercle, supernumerary tubercles and tarsal tubercle absent.

(E) Skin. (30) Dorsal and lateral parts of head and body: snout shagreened, granular, between eyes smooth and shagreened; side of head granular, orbital horn free, pointed, its length 0.78 mm, anterior part of back shagreened; posterior part of back shagreened, granular; upper part of flank shagreened, with glandular warts, lower part of flank granular (31) Cephalic ridges absent. (32) Latero-dorsal folds, lateral line system and "Fejervaryan" line absent. (33) Dorsal parts of limbs: forelimb smooth, with few small glandular warts; thigh and leg with flat glandular warts, tarsus smooth. (34) Ventral parts of head, body and limbs: throat, chest, belly and thigh smooth. (35) Small pairs of pectoral and femoral glands present.

(F) Coloration in alcohol. (36) Dorsal and lateral parts of head and body: dorsal parts of head and dorsum and upper part of flank dark brown, homogeneous, lower parts of flank with darker brown spots; loreal region brown with darker brown indistinct bands including upper lip, tympanum and tympanic region dark brown, tympanic fold underlined by blackish brown. (37) Dorsal parts of limbs: dorsal part of forelimbs, of thigh, of shank and of foot dark brown with indistinct darker brown bands, posterior part of thigh brown with blackish triangle around vent (38) Ventral parts of head, body and limbs: throat, margin of throat, chest and thigh rather dark brown, lower part of belly yellow with brown spots and blackish spots, dark brown spots also on ventral part of thighs; macroglands white

Coloration in life. – Not known.

(G) Male secondary sexual characters. (39) Nuptial spines present on fingers I and II, numerous small brown spines forming two oval patches. (40) Vocal sacs absent, non visible either exteriorly or interiorly. (41) Other male secondary sexual characters: dorsally of vent, presence of a short fleshy flap

Female sexual characters. – Not observed.

Table 1. Measurements (mm) and per mille of snout-vent length (in parenthesis) of five specimens, including holotype, of *Ophryophryne gerti* sp. nov.

Collection number	BMNH 1921 4 1 324	BMNH 1972 15 2 4	BMNH 1921 4 1 323	FMNH 252899	FMNH 252901
Locality	Cam Ly Vietnam	Huey Sapan Laos	Dran, Vietnam	Buon Luo., Vietnam	Buon Luo., Vietnam
Status	Holotype	Paratype	Paratype	Additional material	Additional material
Sex	Adult male	Adult male	Juvenile female	Adult female	Adult female
Snout-vent length	34.8	32.0	21.0	41.4	45.8
Head length	8.5 (244)	8.5 (266)	6.4 (305)	11.0 (266)	11.2 (245)
Tympanum diameter	2.01 (58)	2.13 (67)	1.16 (55)	2.92 (71)	3.24 (71)
Thigh	15.2 (437)	15.6 (488)	8.7 (414)	nm	nm
Shank	15.4 (443)	15.5 (484)	9.3 (443)	17.4 (420)	18.0 (393)
Foot	14.8 (425)	13.4 (419)	7.3 (348)	16.8 (406)	16.9 (369)

Variation. A second male is smaller in body size (tab. 1), but very similar in all body measurements. Its nuptial pads are translucent, which might indicate that he is sub-adult.

Distribution. – *Ophryophryne gerti* is known from Laos and Vietnam.

Etymology. This species is dedicated to my sister Gerti for her help during fieldwork. The invariable specific epithet *gerti* is a noun used in apposition.

Comments. Two female specimens (FMNH 252899, 252901) from Buon Luo (Vietnam) are here tentatively referred to this species. These specimens are distinguished by smooth skin. Skin is in general smoother in female than in male specimens in *Ophryophryne*. As these females are morphologically distinct from the three other species of the genus, but show similarities to the type-specimens of *O. gerti*, they are included in this species.

***Ophryophryne hansi* sp. nov.**

Ophryophryne poilani (non Bourret, 1937: 8) – INGER et al., 1999: 9.

Holotype. FMNH 252880, adult male, Buon Luo (700-750 m), 20 km west of the town of Kannack (14°20'N, 108°36'E), An Khe District, Gia-Lai Province, Vietnam (INGER et al., 1999).

Paratopotypes. FMNH 252873, 252875, 252878-79, 252882, 252884, 252892-93, 7 adult males, 1 adult female.

Diagnosis. Relatively large-sized *Ophryophryne*, with relatively long shank, small tympanum, large head. Dorsal coloration dark, almost black. Supraorbital horn forming small projection, no dermal protuberance bearing anus.

Description of holotype (fig. 2). (A) Size and general aspect. (1) Specimen of medium size (SVL 38.8 mm), body rather stout.

(B) Head. (2) Head very small, wider (HW 12.4 mm) than long (HL 10.4 mm; MN 9.3 mm, MFE 8.1 mm, MBE 4.0 mm), convex. (3) Snout rounded, very protruding, its length



Fig. 2. *Ophryophryne hanst* sp. nov. FMNH 252880, holotype, adult male, SVL 38.8 mm. Dorsal view (left); ventral view (right).

(SL 3.76 mm) shorter than horizontal diameter of eye (EL 4.86 mm) (4) Canthus rostralis rounded, loreal region concave, acute in cross section (5) Interorbital space convex, narrower (IUE 2.72 mm) than upper eyelid (UEW 3.76 mm) and internarial distance (IN 3.04 mm), distance between front of eyes (IFE 6.0 mm) three fifth of distance between back of eyes (IBE 10.0 mm) (6) Nostrils oval, with small flap of skin laterally, closer to eye (EN 1.43 mm) than to tip of snout (NS 1.69 mm) (7) Pupil diamond-shaped, vertical (8) Tympanum (TYD 2.14 mm) distinct, oval, vertical, smaller than half diameter of eye, tympanum-eye distance (TYE 2.46 mm) more than its diameter (9) Pineal ocellus absent (10) Vomerine ridge absent, (11) Tongue large, rounded, not emarginate (12) Supratympanic fold distinct, present from eye to shoulder, posterior part slightly enlarged

(C) Forelimbs. (13) Arm long, thin, fore-arm (FLL 9.7 mm) shorter than hand (HAL 10.9 mm), not enlarged. (14) Fingers long and thin (TFL 5.7 mm) (15) Relative length of fingers, shortest to longest: $I < II < IV < III$ (16) Tips of fingers rounded, not enlarged. (17) Fingers without dermal fringe; webbing absent. (18) Subarticular tubercles indistinct; on fingers I and II a single proximal, oval tubercle. (19) Prepollex oval, indistinct, a single, oval palmar tubercle; supernumerary tubercles absent.

(D) Hindlimbs. (20) Shanks four times longer (TL 18.9 mm) than wide (TW 4.9 mm), about length of thigh (FL 18.7 mm), but longer than distance from base of internal metatarsal tubercle to tip of toe IV (FOL 16.9 mm) (21) Toe IV (FTL 9.1) about one third of distance from base of tarsus to tip of toe IV (TFOL 26.7 mm). (22) Relative length of toes, shortest to longest: $I < II < V < III < IV$. (23) Tips of toes rounded, slightly enlarged; discs absent. (24) Webbing absent: $I 2 \quad 2 \frac{1}{2} \quad II 2 \quad 3 \frac{1}{4} \quad III 3 \quad 3 \frac{1}{2} \quad IV 3 \frac{1}{2} \quad 2 \frac{1}{2} \quad V$ (MTTF 5.53 mm; MTFF 6.32 mm; FTTF 10.40 mm, FFTF 10.40 mm). (25) Dermal fringe along toe V absent. (26) Subarticular tubercles indistinct. (27) Inner metatarsal tubercle long, flat, its length (IMT 3.37 mm) 1.06 times in length of toe I (ITL 3.57 mm). (28) Tarsal fold absent (29) Outer metatarsal tubercle, supernumerary tubercles and tarsal tubercle absent.

(E) Skin. (30) Dorsal and lateral parts of head and body: snout, between eyes, side of head, back and upper part of flanks with glandular warts and horny spinules, on lower part of flank, some of these warts of large size. (31) Cephalic ridges absent. (32) Latero-dorsal folds, lateral line system and "Fejervaryan" line absent (33) Dorsal parts of limbs, forelimb, thigh, leg and tarsus with glandular warts and horny spinules (34) Ventral parts of head, body and limbs, throat, chest with foldings; belly and thigh smooth. (35) Femoral and pectoral glands present; medium sized glands on flanks and rear part of thigh.

(F) Coloration in alcohol. (36) Dorsal and lateral parts of head and body, dorsal parts of head and dorsum grey-brown with dark brown spots, in particular a triangle between eyes, flanks grey-brown with dark brown and white spots, white ones corresponding to glands; loreal region dark brown, tympanum and tympanic region dark brown with a light brown stripe from eye to upper lip, upper lip dark brown with few clear spots (37) Dorsal parts of limbs: dorsal part of forelimbs, of thigh, of shank and of foot grey-brown with broad dark brown bands; posterior part of thigh brown with dark perianal zone and dark zone around femoral glands; femoral glands and glands near vent whitish. (38) Ventral parts of head, body and limbs, throat and margin of throat brown with dark brown spots, chest brown with dark brown spots and whitish pectoral glands, belly and thigh yellowish with brown marblings, pectoral glands whitish.

Coloration in life "In life males vary from black with sharply delimited yellow spots to grey brown with obscure lighter spots; females yellowish grey with obscure, small lighter spots" (INGER et al., 1999: 9).

(G) Male secondary sexual characters. (39) Numerous, small, dark brown nuptial spines forming oval pads on fingers I and II (40) Single vocal sac present, with rounded openings posterior on mouth floor. (41) Other male secondary sexual characters: fleshy flap on vent not present

Female sexual characters (FMNH 252882, SVL 53.5 mm). Large (2.40 mm) creamy-whitish ovocytes in ovary

Table 2 – Measurements (mm) and per mille of snout-vent length (in parenthesis) of type-specimens of *Ophryophryne hansı* sp. nov., from Buon Luoi, Vietnam. Means and standard deviations are given between square brackets. Thigh was not measured in these specimens.

Collection number	FMNH 252880	FMNH 252873, 252875, 252878-79, 252884, 252892-93	FMNH 252882
Status	Holotype	7 paratypes	Paratype
Sex	Adult male	Adult males	Adult female
Snout-vent length	38.8	35.3–43.0 [38.8 ± 2.51]	53.5
Head width	12.4 (320)	11.3–12.9 (291–347) [12.3 ± 0.54 (319 ± 20.9)]	15.8 (295)
Head length	10.4 (268)	10.6–11.7 (258–315) [11.1 ± 0.35 (286 ± 20.1)]	14.5 (271)
Tympanum diameter	2.14 (55)	2.59–2.92 (63–74) [2.72 ± 0.14 (70 ± 4.3)]	3.6 (68)
Shank	18.9 (487)	18.4–19.0 (440–538) [18.9 ± 0.22 (488 ± 33.9)]	25.6 (479)
Foot	16.9 (416)	16.1–18.2 (395–478) [16.8 ± 0.69 (435 ± 31.0)]	23.9 (447)

Variation. – Table 2 gives variation of body measurements for males and female.

Distribution. – Species known only from the type-locality in Vietnam.

Etymology. This species is dedicated to my sister Hansı who very kindly “adopts” my son during periods of fieldwork, thus generously supporting my research. The invariable specific epithet *hansı* is a noun used in apposition.

***Ophryophryne microstoma* Boulenger, 1903**

Ophryophryne microstoma Boulenger, 1903a: 186. – *Type-specimen*: lectotype, by present designation, BMNH 1947.2.22.52 [ex 1903.4.29.106], adult male (examined). *Type-locality*: Mau Son [“Man-Son Mountains, Tonkin, altitude 3000–4000 feet”] (22°00'N, 106°45'E), Lang Son Province, Vietnam.

Megophrys (Ophryophryne) microstoma: DUBOIS, 1980: 473.

Ophryophryne microstoma: DUBOIS, 1987: 23.

Ophryophryne poilani Bourret, 1937: 8. – *Type-specimen*: holotype, by monotypy, MNHN 1948.0113, adult female (examined). *Type-locality*: Dong-Tam-Ve (16°40'N, 106°45'E), concession of the collector E. Poilane near the Aïdao Pass, Quang Tri Province, Vietnam. *New synonym*.

Megophrys (Ophryophryne) poilani: DUBOIS, 1980: 472.

Ophryophryne poilani: DUBOIS, 1987: 23.

Other specimens examined – THAILAND: NE Thailand: BMNH 1974.23.34 (hands and limbs missing). VIETNAM: Man Son Mountains, Tonkin, 3000–4000 feet: BMNH 1947.2.22.50–51 [ex 1903.4.29.104–105], 1947.2.22.53 [ex 1903.4.29.107], Ben En, Thanh Hoa province: MNHN 1997.5258–5260, IEBR D.231; Tam Dao, Viet Tri: FMNH 254250–254251, MNHN 1997.4931–4933.

Diagnosis. An *Ophryophryne* of relatively large size, with relatively short shank, moderate-sized tympanum, small head. Dorsal coloration ochre, rather clear, with distinct pattern. Supraorbital horn distinct, no dermal protuberance bearing anus.

Description of the lectotype (fig. 3) – (A) Size and general aspect – (1) Specimen of medium size (SVL 39.1 mm), body elongate.

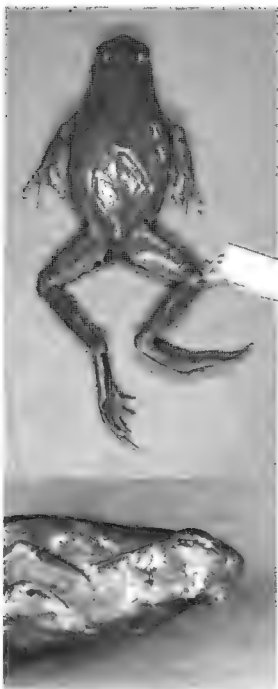


Fig 3. *Ophryophryne microstoma* Boulenger, 1903 BMNH 1947.2.22.52, lectotype, adult male, SVL 39.1 mm. Dorsal view (top); lateral view of head (bottom)

(B) Head (2) Head very small, as wide (HW 9.5 mm) as long (HL 9.4 mm, MN 8.0 mm; MFE 7.0 mm, MBE 4.6 mm), convex. (3) Snout truncate, protruding; its length (SL 3.56 mm) shorter than horizontal diameter of eye (EL 4.54 mm). (4) Canthus rostralis rounded, loreal region concave, acute in cross section (5) Interorbital space convex, narrower (IUE 2.53 mm) than upper eyelid (UEW 3.37 mm) and than internarial distance (IN 3.05 mm); distance between front of eyes (IFE 5.6 mm) about two thirds of distance between back of eyes (IBE 8.8 mm). (6) Nostrils oval, with small flap of skin laterally, at equal distance to tip of snout (NS 1.62 mm) and to eye (EN 1.56 mm). (7) Pupil indistinct, shape not visible. (8) Tympanum (TYD 2.59 mm) rounded, rather distinct, more than half eye diameter; tympanum-eye distance (TYE 1.94 mm) two thirds of its diameter. (9) Pineal ocellus absent. (10) Vomerine ridge absent. (11) Tongue moderate, rounded, thick, emarginate, adhering largely to mouth floor (12) Supratympanic fold prominent, present from eye to shoulder.

(C) Forelimbs. - (13) Arm rather long, fore-arm (FLL 9.5 mm) not enlarged, longer than hand (HAL 9.2 mm) (14) Fingers I, II and IV short and thin; finger III long and thin (TFL 5.57 mm). (15) Relative length of fingers, shortest to longest: $I < II = IV < III$ (16) Tips of fingers rounded, not enlarged, without distinct grooves. (17) Fingers without dermal fringe, webbing absent. (18) Subarticular tubercles absent (19) Prepollex oval, distinct; palmar tubercles indistinct; supernumerary tubercles indistinct

(D) Hindlimbs. - (20) Shanks four times longer (TL 16.0 mm) than wide (TW 3.9 mm), longer than thigh (FL 15.8 mm) and than distance from base of internal metatarsal tubercle to tip of toe IV (FOL 15.4 mm). (21) Toe IV (FTL 7.4) about one third of distance from base of tarsus to tip of toe IV (IFOL 23.3 mm) (22) Relative length of toes, shortest to longest: $I < II < V < III < IV$. (23) Tips of toes rounded, not enlarged, without distinct grooves. (24) Webbing absent: $I2 - 2\frac{1}{2}$ $II2 - 3$ $III3 - 4$ $IV4 - 3$ V (MTTF 4.47 mm; MTFF 5.39 mm; FTTF 7.89 mm; FFTF 8.03 mm). (25) Dermal fringe along toe V absent (26) Subarticular tubercles absent. (27) Inner metatarsal tubercle indistinct, its length (IMT non measurable, about 2 mm) 1.4 times in length of toe I (ITL about 2.8 mm). (28) Tarsal fold absent (29) Outer metatarsal tubercle, supernumerary tubercles and tarsal tubercle absent.

(E) Skin (30) Dorsal and lateral parts of head and body, snout, between eyes, side of head and back shagreened, upper and lower part of flank shagreened covered with granules. (31) Cephalic ridges absent (32) Latero-dorsal folds, lateral line system and "Fejervaryan" line absent. (33) Dorsal parts of limbs, forelimb, thigh, leg and tarsus shagreened, with granules. (34) Ventral parts of head, body and limbs: throat, chest, belly and thigh smooth (35) Pectoral glands, femoral glands and glandular tympanic fold present

(F) Coloration in alcohol. (36) Dorsal and lateral parts of head and body, dorsal parts of head and dorsum and upper part of flank dark ochre, homogeneous, dorsal folds with some small darker spots, lower part of flank beige with ochre spots and some dark brown spots, loreal and tympanic regions dark ochre, tympanum transparent, upper lip dark ochre (37) Dorsal parts of limbs, dorsal part of forelimbs, of thigh, of shank and of foot ochre with darker bands, posterior part of thigh ochre with distinct dark brown spots. (38) Ventral parts of head, body and limbs ground light yellow, almost entirely covered by ochre on throat, chest and upper vent, with large ochre flecks on ventral part of belly, leaving light yellow ground out; posterior part of vent light yellow; thigh light yellow with dense ochre spots, webbing ochre; macroglands whitish.

Coloration in life (specimen IEBR D231). Dorsal parts of head and dorsum ochre, with darker brown grey pattern and sand colored crests. Flanks brown grey and sand colored with black spots, inferior part with white warts. Loreal region coppery brown, iris copper colored with network of melanophores, tympanic region anteriorly dark reddish brown and posteriorly coppery brown, tympanum coppery brown, upper lip continuous with other parts of side of head. Forelimbs, dorsal part of thigh, dorsal part of leg and foot brown grey and sand color with black spots. Posterior part of thigh dark and whitish grey with brownish spots and white warts; femoral glands ivory. Throat brownish, chest coppery brown with ivory colored pectoral glands, belly coppery brown with white spots anteriorly, and whitish grey with dark brown spots in its posterior part. Ventral side of thigh whitish grey with brown spots

(G) Male secondary sexual characters. (39) Traces indicate that nuptial spines have been present on fingers I and II, with spines small, numerous. (40) Vocal sacs not observed (to preserve holotype) (41) Other male secondary sexual characters: dorsally of vent, presence of a small fleshy flap.

Female sexual characters (adult female MNHN 1997.5259) Large glandular circumvolute oviduct; creamy white, small sized, immature ovocytes (this female probably just laid eggs).

Variation Sexual dimorphism of body size is rather pronounced (tab. 3). Females show smaller heads and shorter shanks than males. The differences of head size of the holotype of *O. poilani* (fig. 4) to the other females should be imputed to poor condition of this specimen, as well as absence of supraorbital horn, a dermal structure which might easily be destroyed. In life, the pupil of specimen IEBR D 231 showed horizontally enlarged diamond-shape, thus confirming the horizontal shape of pupil mentioned in the original description of the genus.

Distribution China, Thailand, Vietnam. Species previously not cited from Thailand

Etymology The Greek term *microstoma* describes the small mouth, characteristic for the species of this genus.

***Ophryophryne pachyproctus* Kou, 1985**

Ophryophryne pachyproctus Kou, 1985: 41. – *Type-specimen* holotype, by original designation, YL A.8311032, adult male (not examined). – *Type-locality* Zhushihe (alt. 1000 m), Mengla Xian (21°29'N, 101°33'E), Yunnan, China

Specimens examined CHINA: Zhushihe (alt. 1000 m), Mengla Xian (21°29'N, 101°33'E), Yunnan: CIB A 8311038, male, paratype, VIETNAM: Nghe An Province. MNHN 2000 9087, male

Diagnosis. – Small-sized *Ophryophryne*, with relatively short shank, large tympanum, small head. Dorsal coloration dark. Supraorbital horn small, anus terminal on a distinct dermal protuberance.

Description of paratype CIB A 8311038 (fig. 5) (A) Size and general aspect – (1) Specimen of rather small size (SVL 30.0 mm), body rather slender.

Table 3 – Measurements (mm) and per mille of snout-vent length (in parenthesis) of specimens of *Ophryophryne microstoma* Boulenger, 1903, including lectotype of *Ophryophryne microstoma* and holotype of *Ophryophryne poilani* Bourret, 1937. Means and standard deviations are given between square brackets.

Collection number	BMNH 1947 2 22 52	MNH 1997 5258, 1997 5260; FMNH 254251	MNH 1948 01 3	BMNH 1947 2 22 50-51, 1947 2 22 53, 1974 2334, 1997 5259, FMNH 254250
Locality	Mau Son, Vietnam	Ben En & Tam Dao, Vietnam	Dong-Tam-Ve, Vietnam	Ben En, Mau Son & Tam Dao, Vietnam
Status	Lectotype of <i>O. microstoma</i>	Additional material	Holotype of <i>O. poilani</i>	Paralectotypes of <i>O. microstoma</i> (BMNH) and additional material (FMNH)
Sex	Adult male	3 adult males	Adult female	6 females
Snout-vent length	39.1	38.1-44.4 [41.4 ± 3.17]	47.1	24.6-56.5 [46.1 ± 11.5]
Head width	9.5 (24%)	9.7-12.4 (25.5-28.5) [11.1 ± 1.44 (27.3 ± 16.0)]	11.5 (24%)	8.1-15.1 (24.2-32.9) [12.1 ± 2.47 (26.9 ± 33.0)]
Head length	9.4 (24%)	9.0-11.9 (23.6-27.0) [10.7 ± 1.53 (25.8 ± 19.1)]	9.5 (20%)	7.4-14.0 (23.6-40.1) [11.5 ± 2.59 (25.7 ± 26.8)]
Tympanum diameter	2.44 (6%)	2.59-3.37 (6.8-7.8) [3.07 ± 0.42 (7.4 ± 5.07)]	2.72 (5%)	1.52-4.60 (5.9-8.1) [3.09 ± 1.13 (6.6 ± 8.7)]
Thigh	15.8 (40%)	19.0-19.6 (42.8-46.9) [19.3 ± 0.42 (44.8 ± 29.0)]	19.8 (42%)	11.5-25.2 (38.2-46.7) [19.6 ± 5.79 (43.4 ± 16.4)]
Shank	6.0 (15%)	6.2-19.4 (42.3-46.4) [18.1 ± 1.70 (43.8 ± 23.0)]	19.4 (41%)	11.4-23.9 (37.2-46.3) [18.9 ± 4.17 (41.4 ± 31.5)]
Foot	5.4 (14%)	4.0-19.2 (36.7-43.8) [17.2 ± 2.78 (41.3 ± 39.2)]	18.6 (39%)	9.6-20.8 (36.8-39.0) [17.2 ± 4.58 (37.8 ± 9.46)]



Fig. 4. *Opisthopryx microstoma* Boulenger, 1903. MNHN 1948.0113: holotype of *Opisthopryx polina* Bourret, 1937, adult female, SVL 47.1 mm. Dorsal view (top), lateral view of head (bottom).



Fig 5 *Ophiophryne pachiproctus* Kou, 1985 CIBA 8311038 paratype subadult male, SVL 30.0 mm
Dorsal view (top), lateral view of head (bottom)

(B) Head. (2) Head very small, slightly wider (HW 7.9 mm) than long (HL 7.4 mm, MN 6.5 mm, MFE 5.3 mm; MBE 2.7 mm), flat. (3) Snout truncate, very protruding, its length (SL 2.9 mm) shorter than horizontal diameter of eye (EL 3.4 mm). (4) Canthus rostralis sharp, loreal region concave, acute in cross section. (5) Interorbital space flat, narrower (IUE 1.5 mm) than upper eyelid (UEW 2.2 mm) and internarial distance (IN 2.4 mm); distance between front of eyes (IFE 4.4 mm) two third of distance between back of eyes (IBE 6.7 mm). (6) Nostrils rounded, without flap of skin laterally, at equal distance from eye (EN 1.0 mm) and tip of snout (NS 1.0 mm). (7) Pupil indistinct diamond. (8) Tympanum (TYD 2.2 mm) very distinct, rounded; smaller than half diameter of eye, tympanum-eye distance (TYE 1.2 mm) half its diameter (9) Pineal ocellus absent. (10) Vomerine ridge absent (11) Tongue rounded, not emarginate (12) Supratympanic fold distinct, present from eye to above shoulder, posterior part enlarged

(C) Forelimbs (13) Arm rather long, thin, fore-arm (FLL 7.5 mm) shorter than hand (HAL 7.9 mm), not enlarged. (14) Fingers long and thin; finger III long, thin (TFL mm) (15) Relative length of fingers, shortest to longest: I < II < IV < III. (16) Tips of fingers rounded, slightly enlarged. (17) Fingers without dermal fringe; webbing absent. (18) Subarticular tubercles indistinct, all absent. (19) Prepollex oval, distinct, a single, oval palmar tubercle; supernumerary tubercles absent.

(D) Hindlimbs (20) Shanks four times longer (TL 13.1 mm) than wide (TW 3.4 mm), a little shorter than thigh (FL 14.3 mm), but longer than distance from base of internal metatarsal tubercle to tip of toe IV (FOL 12.6 mm). (21) Toe IV long (FTL mm; TFOL 19.4 mm). (22) Relative length of toes, shortest to longest: I < II < V < III < IV (23) Tips of toes rounded, scarcely enlarged; discs absent. (24) Webbing absent (MTFF 6.1 mm, MTFF 6.2 mm; FTTF 7.1 mm; FTF 6.50 mm). (25) Dermal fringe along toe V absent (26) Subarticular tubercles absent. (27) Inner metatarsal tubercle long, scarcely distinct, its length (IMT 1.3 mm) 1.77 times in length of toe I (ITL 2.3 mm) (28) Tarsal fold absent. (29) Outer metatarsal tubercle, supernumerary tubercles and tarsal tubercle absent.

(E) Skin. (30) Dorsal and lateral parts of head and body: snout, between eyes and side of head shagreened; back shagreened with fine glandular folds and few glandular warts posteriorly, flanks with few glandular warts. (31) Cephalic ridges absent. (32) Latero-dorsal folds, lateral line system and "Fejervaryan" line absent (33) Dorsal parts of limbs forelimb, thigh, leg and tarsus shagreened. (34) Ventral parts of head, body and limbs throat, chest, belly and thigh smooth (35) Femoral and pectoral glands small, present; supra-anal protuberance distinct, bearing at its distal part a ventral cloacal opening

(F) Coloration in alcohol. (36) Dorsal and lateral parts of head and body dorsal parts of head and dorsum almost uniformly dark brown, flanks slightly clearer, their lower parts clear greyish brown with few dark spots, more or less in a line; loreal region dark brown, tympanum orange brown, tympanic region dark brown, upper lip dark brown with an indistinct darker band (37) Dorsal parts of limbs: dorsal part of forelimbs, of thigh, of shank and of foot brown with fine dark brown transversal bands, posterior part of thigh light greyish brown with a large dark triangular perianal zone extending to knees (38) Ventral parts of head, body and limbs: throat brown, margin of throat dark brown, chest and upper part of belly brown, lower part yellowish with dark brown flecks; thigh yellowish, macroglands whitish

Table 4 Measurements (mm) and per mille of snout-vent length (parenthesis) of two specimens, including paratype, of *Ophryophryne pachyproctus* Kou, 1985

Collection number	CJB A 8311038	MNHN 2000 9087
Locality	Zhushu, China	Nghe An, Vietnam
Status	Paratype	Additional material
Sex	Subadult male	Adult male
Snout-vent length	30.0	28.9
Head width	7.9 (263)	8.3 (287)
Head length	7.4 (247)	8.3 (287)
Tympanum diameter	2.2 (73)	2.59 (90)
Thigh	14.3 (478)	11.7 (405)
Shank	13.1 (437)	12.0 (415)
Foot	12.6 (420)	12.1 (419)

Coloration in life (according to the original description). Dorsal surface grey white or brown grey, a dark, distinct or indistinct triangle between eyes; side of head, lips, throat, chest and belly dark colored, sides of head and body bearing 4-6 black spots, posterior part of thighs and ventral surface of hands black brown, fore and hind legs dark colored, forearm and thigh generally with a large black spot; dorsal surface of hands and external surface of legs usually with black spots, palm and upper surface of hands orange red, tips of fingers light red, tips of toes dark. When put to alcohol, coloration gets darker, reddish parts turn white.

(G) Male secondary sexual characters. - Not observed (male not adult?).

Female sexual characters. Not observed.

Variation - The measurements of the two specimens studied are given in tab. 4. Only larger samples might inform about the significance of the differences observed between the specimen from Vietnam and from China.

Distribution. China (Yunnan) and Vietnam (Nghe An Province).

Etymology - The term *pachyproctus*, "having a thick vent", is derived from the Greek *pakhys*, "thick" and *proktos*, "vent".

KEY TO THE KNOWN SPECIES OF THE GENUS *Ophryophryne*

- 1a. Palmar tubercle distinct 2
- 1b. Palmar tubercle indistinct 3
- 2a. Dorsal skin with glandular warts and horny spinules; cloacal appendage absent, adult males SVL 35.5-43.0 mm, TL 18.4-19.0 mm, adult female SVL 53.5 mm, TL 25.6 mm *O. hansui*
- 2b. Dorsal skin shagreened, cloacal appendage present; adult males SVL 28.9-30.0 mm, TL 12.0-13.0 mm *O. pachyproctus*

- 3a. Dorsum dark brown, posterior part of shank with fine brownish marbling, body size small: adult males SVL 32.0-34.8 mm, TL 15.4-15.5 mm; adult females SVL 41.4-45.8 mm, TL 17.4-18.0 mm; vocal sacs absent *O. gerti*
- 3b. Dorsum greyish-brown; posterior part of shank with large brown spots; body size larger: adult males 38.1-44.4 mm, TL 16.0-19.4 mm; adult females SVL 46.3-56.5 mm, TL 18.1-23.9 mm; vocal sacs present *O. microstoma*

DISCUSSION

In *Ophryophryne*, several trends, which can also be observed in the sister-group *Xenophrys*, occur, such as diminutive size, reduction of palpebral horn and variation of structure in dorsal skin. Characters used to differentiate these two taxa are mostly linked to reduction of the size of the of skull in *Ophryophryne*.

The geographic distribution of the genus *Ophryophryne* includes Laos, Thailand, Vietnam (northern and central), as well as China (Yunnan and Guangdong Provinces) (fig. 6). It is completely included in the distributional range of its sister-group *Xenophrys*, but shows a much reduced extension. This range may still be increased by further observations, when field data are accumulated, as all over its range only few specimens have been collected since its description a century ago.

The species referred to the genus show a complex pattern of distribution. The range of *O. pachyproctus* seems to be similar to that of *O. microstoma*, as are the ranges of *O. hanssi* and *O. gerti*. The distribution areas of both species couples are allopatric with a large area without data. The new species *O. hanssi* is known only from its type-locality. However, additional field data are likely to extend its range, as has occurred for *O. pachyproctus*, which was known for some years from its type-locality only, but now can be considered as a member of the fauna of northern Vietnam. For *O. microstoma* the distributional range can be extended to Thailand. There is no evidence for syntopic occurrence of two or more species of *Ophryophryne*. *O. gerti* and *O. hanssi* have the same collecting locality, but the females of *O. gerti* were collected in a swampy area, whereas *O. hanssi* males were actively calling along a stream (INGER et al., 1999). This does not confirm that the two species occur in different habitats, as obviously one species was reproductively active, but not the other. Mature *O. microstoma* were collected along a small stream (personal observation), as was described for *O. hanssi*. *O. microstoma* and *O. pachyproctus* share a large distribution range. On the opposite, *O. pachyproctus* and *O. gerti* do not share distribution range according to the current data.

The synonymy of *O. poilani* is based on morphological data, especially on measurement of tibia length, which should be relatively precise despite the poor state of preservation of its type-specimen. *O. hanssi* is the species showing the largest head size, but the type of *O. poilani* has a head width smaller than all studied specimens of *O. hanssi*. The type-specimen of *O. poilani* clearly is not conspecific with the specimens that INGER et al. (1999) mentioned as *O. poilani*. This type specimen has definitely shorter tibia than *O. hanssi*, but its tibia length is included in the range of variation observed in *O. microstoma*.

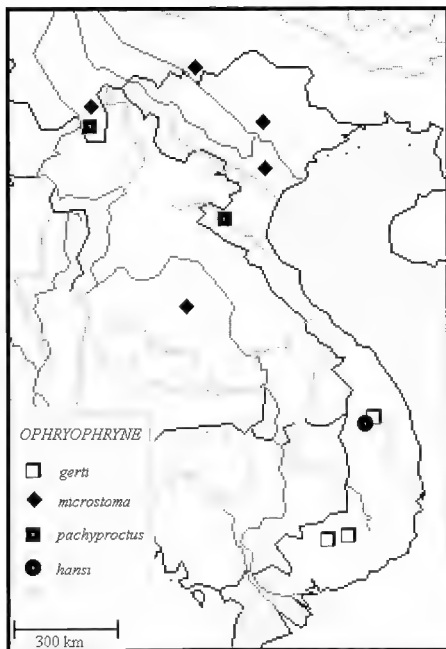


Fig. 6 – Collection localities of species of the genus *Ophryophryne* Boulenger, 1903

Ophryophryne hansii is relatively distinct from the other three species and shows plesiomorphic characters, such as relatively large head (320 p.m. of SVL) and large body size. The cloacal appendage of *O. pachyproctus* is a unique character, present only in this species. The tubercles on the vent observed in some of the specimens of other species of *Ophryophryne* do not form a cone including the anal opening. They form dermal structures which surround the anal opening. Size reduction is probably independent in *O. pachyproctus* and *O. gerti* as both only share this character. The two species are distinct for presence of palmar tubercles, length of inner toe and size of tympanum.

Ophryophryne species show an important reduction of head size. These species have a small mouth and a tongue fixed to the mouth floor which does not allow them to capture and swallow large-sized prey. Such morphological adaptations can be observed in various groups of frogs and has been studied in *Rhinophrynus* Duméril and Bibron, 1841 and in the Microhylidae Noble, 1931 (TRUEB & GANS, 1983; BLUM & MENZIES, 1988). A small head is usually linked to a special nutritional mode and a fossorial life (DULLMAN & TRUEB, 1985). The shape of the hindlimbs, in particular the feeble development of the inner metatarsal tubercle, does not indicate any particular adaptation to fossorial life in *Ophryophryne*. The particular buccal anatomy might be linked to the nutritional mode of these species. Their digestive tract is well developed, showing a large gastric pouch, but it was found empty in the specimens examined (personal observations). Nothing is known about foraging in nature. In laboratory conditions they accept young insects as well as earthworms (R. Boistel, unpublished observations). The structural similarity of buccal anatomy in *Ophryophryne* and *Xenobatrachus* and *Xenorhina* (Microhylidae) might indicate that these frogs have similar diets. *Xenobatrachus* and *Xenorhina* feed on earthworms (BLUM & MENZIES, 1988) and have well developed vomerine teeth on the buccal roof, which seem to be crucial for ingestion of this food. Such structures are absent in *Ophryophryne*. New data on the biology of these species will be necessary to understand the ecological role and niche of small mouthed megophryids in the amphibian communities of southeast Asian primary forests.

RÉSUMÉ

L'étude des spécimens-types et des spécimens récemment collectés de crapauds du genre oriental *Ophryophryne* Boulenger, 1903 (Megophryidae) nous mène à la redéfinition des taxa reconnus et de la définition de deux nouvelles espèces dont une est rapportée du Vietnam et du Laos et l'autre seulement du Vietnam. *Ophryophryne poilani* Bourret, 1937 est mis en synonyme d'*Ophryophryne microstoma* Boulenger, 1903. L'aire de distribution de l'espèce *O. microstoma*, qui incluait le Vietnam et la Chine, est élargie à la Thaïlande. *Ophryophryne pachyproctus* Kou, 1985 est confirmé du Vietnam.

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